

PATENT SPECIFICATION



Application Date: Aug. 11, 1927. No. 21,148/27.

302,193

Complete Left: June 11, 1928.

Complete Accepted: Dec. 17, 1928.

PROVISIONAL SPECIFICATION.

Apparatus for use in Moulding or Producing Articles of Glass.

I, WILLIAM BELL MITCHELL, of Holmfield, Cross Banks, Shipley, in the County of York (of British nationality), do hereby declare the nature of this invention to be as follows:—

This invention relates to apparatus for use in moulding or producing articles of glass such as stoppers for bottles when the glass is in a plastic condition. My invention consists in the formation and arrangement of the several devices herein-after described whereby the plastic material may be automatically fed to said apparatus which will be kept continuously in motion although it will carry out the formation of the articles in step by step sequence, thus the mechanism when started into motion operates continuously while the plastic substances are fed thereto, are formed thereby into the articles desired and are discharged therefrom continuously in the order and manner hereinafter fully explained.

In carrying my invention into effect as is before stated in connection with the production of glass stoppers for bottles and the like, I mount my machine or apparatus in proximity to a furnace where the glass is brought into its plastic condition and from this furnace I conduct the glass through an appropriately controlled orifice so that the discharge of the glass from the furnace may be regulated and kept constant in order that it may be supplied in the desired quantities and at the proper time to the moulds.

The apparatus I make use of consists of a rotary member upon which are mounted a series of moulds, each of which will receive in succession the desired quantity of material so that same may be pressed into the mould in the sequence or order hereinafter explained.

Each mould consists of a base part which is pivoted in such manner that it may descend to discharge the moulded article, and above this base piece are two pairs of jaws one pair to form the body of the article and another pair to receive a superfluity of the plastic substance so that the plunger which compresses the glass into the lower mould will also com-

press the superfluous material into the upper pairs of dies or moulds which will engage with it in such manner as to permit the withdrawal of the pressing plunger without disturbing the moulded article.

These moulds are mounted upon the rotary member hereinbefore described and at or near the peripheral edge or rim of same so that by rotating said rotary member about a centrally fixed shaft I am enabled to bring each mould into position beneath a pair of shears or cutting devices which are mounted upon bearings that are supported by the central stationary shaft. These shears are actuated by an appropriately shaped double acting cam that is oscillated to effect the movement of the shears at the desired time to clip or shear off the pendant plastic glass as it is descending from the orifice hereinbefore referred to.

This clipped off or detached portion of glass then descends into a shoot which is adjusted to receive same and to conduct it into the mould formed by the upper and lower pairs of dies which at this time are in position for engaging with and supporting the base of said mould ready to receive said cut-off glass. At this time the upper pair of dies are open so that the cut-off glass may be guided by them into the proper position beneath.

The said actions are carried out during the continuous motions of the dies under the shears as above stated, and said dies after leaving their position near the shears pass along so that, by cam surfaces engaging with extensions from the die members these latter are operated. The said cam surfaces are fixed upon the peripheral rim of the annular member that is fixed to the central shaft or which may be otherwise fixed so that as the dies continue to move around said cam surface the members of the upper pair are closed and a piston or plunger, which is arranged above same, is caused to descend to compress the glass within the dies. As the piston descends and before it commences its pressing actions it relieves a member which falls and spans projecting

[Price 1/-]

Best Available Copy

parts from the dies in order to securely and positively hold said dies against being opened by the plunger being made to descend to press the glass into the die 5 beneath and against the base of said die.

When the said plunger is thus pressing the glass into the mould it also forces a portion of same in a lateral direction to cause it to enter the upper part of the die 10 by which means when the piston is raised at the next step of the movement of the advancing moulds said laterally compressed portion of glass prevents the piston from withdrawing any part thereof 15 as it is withdrawn from the mould.

After the mould has sufficiently advanced for the piston to be withdrawn therefrom the spanning or clamping device is also simultaneously withdrawn 20 and the upper part of the die is then opened and on proceeding comes into contact with a cutting blade (preferably stationary although it may be rotated for certain purposes) and this cutting blade 25 cuts off the superfluous glass that extends above the article that has been moulded in the dies beneath.

This cut-off portion of glass (when it is thus severed from the body part) is 30 arranged to be blown by a blast of air which assists to cool same while yet removing it from the die in order that it may be conducted down a shoot into any suitable receptacle adjoining.

The die then continues and as it approaches the place where the article has to be discharged the lower part of the die is opened to release the base and this 35 then descends to carry with it the moulded article. This article is acted upon by another blast of air so that it may be

blown away from the die to descend 45 through a shoot into a revolving screen or carrier while the die continues its progressive motion in order that the base part again may be raised by appropriate guiding devices which are stationary so that on being raised into its desired position the lower pair of dies are closed upon 50 it while the upper pair are also closed to form the mould and there hold same in position in order to present it beneath the shears first before described in this manner the sequence of operations may be repeated. 55

The screen or guiding receptacle into which the cut-off article of glass has passed, is arranged to be revolved by any appropriate gearing. And during its 60 said rotary motions by having an inner spirally formed flange fixed within it to extend throughout its entire length, while it is mounted in a sufficiently inclined position relative to the horizontal plane 65 the article within it is by gravity and the rotary motion of the screen caused to follow the revolving spiral flange within said screen until it finally reaches the opposite end from which it is discharged into an appropriate receptacle to receive 70 same.

Appropriate driving gear either electrically or otherwise operated is employed for imparting motion to the revolving member which carries the moulds, and to 75 the fan or air propeller as may be found advantageous.

Dated the 9th day of August, 1927.

SAMUEL HEY,
Agent.

COMPLETE SPECIFICATION.

Apparatus for use in Moulding or Producing Articles of Glass.

I, WILLIAM BELL MITCHELL, of Holmfield, Cross Banks, Shipley, in the County 80 of York (of British nationality), do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:— 85

This invention relates to apparatus for use in the manufacture of articles of glass, such as glass stoppers for bottles as well as other articles known in the trade as 90 "pressed goods" and more particularly to that class wherein when the apparatus is in use the moulds are revolved in the horizontal plane continuously while the feeding of the glass to said moulds is

automatically carried out during said 95 continuous actions, and my present invention consists in mounting the moulds upon fixed studs carried by the rotary table of the machine so that by cam actions two 100 pairs of separate members forming each of said moulds and a third member forming the base thereof are actuated by cam action to open and close as desired, while 10 other devices are brought into use in such a manner that by securing the upper pair of members the whole mould is firmly held 10 during the pressing action. My said invention further extends to the application of cam lever devices which under the yielding actions of a spring, will transmit 11 motion to the pressing members which

press the glass into the mould while other devices are employed for cutting off and conveying away the superfluous glass in one position or part of the machine and other conveying apparatus in another part of the machine is actuated to receive and convey away the moulded articles, all of the said actions being performed automatically.

10 In order that my said invention may be readily understood I have hereunto appended sheets of drawings illustrating apparatus made in accordance therewith the same being referred to in the following description:—

15 Fig. 1 is a plan of the apparatus the several parts of which are constructed and arranged as hereinafter explained.

Fig. 2 is a front elevation of the apparatus shown by Fig. 1.

Fig. 3 is an elevation of the apparatus shown by Fig. 1 as seen looking in a direction from left to right of said figure.

Fig. 4 is a similar elevation to Fig. 3 but shows the apparatus as seen looking from right to left of Fig. 1.

Fig. 5 is a sectional plan showing the revolving disc or table carrying the moulds around a fixed central pillar as is hereinafter explained.

Fig. 6 is an elevation showing one pair of moulds and devices employed for operating same as hereinafter described.

Fig. 7 is a sectional elevation showing the moulds as seen in a direction looking from right to left of Fig. 6.

Fig. 8 is a sectional plan of bearings which support members for operating the moulds.

Fig. 9 is an elevation of a spring actuated cam-lever hereinafter described.

A indicates the base upon which the machine's fixed framework B is mounted.

15 In carrying my invention into effect (as is hereinbefore stated), in connection with the production of glass stoppers for bottles and the like, I mount my machine or apparatus as shown by Fig. 1 in proximity to a furnace 2 where the glass 3 is brought into its plastic condition and from this furnace 2 I conduct the glass through any appropriately controlled discharge-orifice as is well known so that the discharging of the glass (in a stream 3 shown in broken lines of Fig. 3) may be regulated and kept constant in order that it may be supplied in desired quantities and at the proper time to the moulds 4.

20 The apparatus I make use of consists of a rotary member or table 5 (mounted to rotate in the direction of the arrow 50 Fig. 5) upon which are mounted a series of moulds 4. I have shown five moulds in the drawings although I may make use

of a larger or fewer number as circumstances may render advisable.

Each of these moulds 4 is arranged to receive in succession the desired quantity of material from the supply 3 so that same may be pressed into the mould (and be discharged therefrom through openings c made in the table 5) in the sequence or order hereinafter explained.

The rotary member or table 5 is supported by antifriction bowls or runners 5a, 5b, 5c and 5d while it is guided and supported in its circular path by a central stationary pillar or shaft 6.

The rotary motion of the table 5 (which is continuous when in use) is transmitted thereto by the worm wheel 7 being fixed upon the hub 5g of the table 5. This wheel 7 is arranged to receive its motion from any appropriate motor through the medium of the worm 8 which is fixed upon a shaft 9a that extends beyond the framework of the machine to receive at its outer end a spur wheel 10.

This wheel 10 derives its motion from the wheel 11 which is actuated from the shaft 11a of any prime motor that may be found advantageous, such as that of an electric motor 12.

Each mould 4 has a base piece 4a which is fixed upon a lever 13 pivoted at 13a to a bracket carried by the table 5 while the other end of the lever 13 has an adjusting screw 13b which will slide over a guiding cam plate 14 (Fig. 3) that extends around the framework of the machine to act as hereinafter described.

The base-piece 4a has a lateral flange t (see Figs. 3 and 7) which takes into a groove formed in the mould so that the pressure put upon this base-piece 4a may be withstood by said flange t.

Each mould 4 is formed in four parts (Figs. 6 and 7), two parts a and a¹ being to form the lower or shaping part of the mould in which the article (such as a stopper b) is cast or moulded (see Fig. 7), the other moulds d and d¹ are to form the upper parts of same to receive the molten glass f when the mould is placed beneath the shoot 15 which receives the glass 3 as it descends as is hereinafter explained.

All the members of the two pairs of moulds a, a¹ and d, d¹ are mounted upon a common stud x (Fig. 5) so that they may swivel thereon.

Each jaw in the two pairs of jaws or members of the moulds a, a¹ and d, d¹ is actuated by its respective link 16, 16a or 17, 17a and these pairs of links are actuated by cross bars 18, 18a while in connection with each complete mould the said cross bars 18, 18a are carried by sliding bolts 19, 19a.

Each mould 4 is formed in four parts (Figs. 6 and 7), two parts a and a¹ being to form the lower or shaping part of the mould in which the article (such as a stopper b) is cast or moulded (see Fig. 7), the other moulds d and d¹ are to form the upper parts of same to receive the molten glass f when the mould is placed beneath the shoot 15 which receives the glass 3 as it descends as is hereinafter explained.

All the members of the two pairs of moulds a, a¹ and d, d¹ are mounted upon a common stud x (Fig. 5) so that they may swivel thereon.

Each jaw in the two pairs of jaws or members of the moulds a, a¹ and d, d¹ is actuated by its respective link 16, 16a or 17, 17a and these pairs of links are actuated by cross bars 18, 18a while in connection with each complete mould the said cross bars 18, 18a are carried by sliding bolts 19, 19a.

Each mould 4 is formed in four parts (Figs. 6 and 7), two parts a and a¹ being to form the lower or shaping part of the mould in which the article (such as a stopper b) is cast or moulded (see Fig. 7), the other moulds d and d¹ are to form the upper parts of same to receive the molten glass f when the mould is placed beneath the shoot 15 which receives the glass 3 as it descends as is hereinafter explained.

All the members of the two pairs of moulds a, a¹ and d, d¹ are mounted upon a common stud x (Fig. 5) so that they may swivel thereon.

Each jaw in the two pairs of jaws or members of the moulds a, a¹ and d, d¹ is actuated by its respective link 16, 16a or 17, 17a and these pairs of links are actuated by cross bars 18, 18a while in connection with each complete mould the said cross bars 18, 18a are carried by sliding bolts 19, 19a.

Each mould 4 is formed in four parts (Figs. 6 and 7), two parts a and a¹ being to form the lower or shaping part of the mould in which the article (such as a stopper b) is cast or moulded (see Fig. 7), the other moulds d and d¹ are to form the upper parts of same to receive the molten glass f when the mould is placed beneath the shoot 15 which receives the glass 3 as it descends as is hereinafter explained.

All the members of the two pairs of moulds a, a¹ and d, d¹ are mounted upon a common stud x (Fig. 5) so that they may swivel thereon.

Each jaw in the two pairs of jaws or members of the moulds a, a¹ and d, d¹ is actuated by its respective link 16, 16a or 17, 17a and these pairs of links are actuated by cross bars 18, 18a while in connection with each complete mould the said cross bars 18, 18a are carried by sliding bolts 19, 19a.

Each mould 4 is formed in four parts (Figs. 6 and 7), two parts a and a¹ being to form the lower or shaping part of the mould in which the article (such as a stopper b) is cast or moulded (see Fig. 7), the other moulds d and d¹ are to form the upper parts of same to receive the molten glass f when the mould is placed beneath the shoot 15 which receives the glass 3 as it descends as is hereinafter explained.

All the members of the two pairs of moulds a, a¹ and d, d¹ are mounted upon a common stud x (Fig. 5) so that they may swivel thereon.

Each jaw in the two pairs of jaws or members of the moulds a, a¹ and d, d¹ is actuated by its respective link 16, 16a or 17, 17a and these pairs of links are actuated by cross bars 18, 18a while in connection with each complete mould the said cross bars 18, 18a are carried by sliding bolts 19, 19a.

Each mould 4 is formed in four parts (Figs. 6 and 7), two parts a and a¹ being to form the lower or shaping part of the mould in which the article (such as a stopper b) is cast or moulded (see Fig. 7), the other moulds d and d¹ are to form the upper parts of same to receive the molten glass f when the mould is placed beneath the shoot 15 which receives the glass 3 as it descends as is hereinafter explained.

All the members of the two pairs of moulds a, a¹ and d, d¹ are mounted upon a common stud x (Fig. 5) so that they may swivel thereon.

Each jaw in the two pairs of jaws or members of the moulds a, a¹ and d, d¹ is actuated by its respective link 16, 16a or 17, 17a and these pairs of links are actuated by cross bars 18, 18a while in connection with each complete mould the said cross bars 18, 18a are carried by sliding bolts 19, 19a.

These bolts 19, 19a are each formed in two parts (see Fig. 8) an outer or sleeve part y (which is arranged to fit and slide through its bearings y^1 and to receive a yielding spring y^2) and an inner part y^3 , thus the said spring will yield when too great a pressure is put thereon. The said bolts 19 and 19a are actuated by their respective advancing cams 20 and 20a (Fig. 5) and retracting cams 20b and 20c, the former being arranged to act upon their respective bolts 19, 19a by both of them commencing their outward actions thereon at the point p^3 and while the cam 20 will extend its said outward retaining actions thereon to the point p^4 , the cam 20a will have ended or finished its actions at p^5 (Fig. 5). The retracting cam 20c will commence its actions on its bolt 19a at the point p^6 and finish at p^7 . The retracting cam 20b will commence at the point p^8 and finish at p^9 .

The base 4a of each mould 4 is retained in its position at the lower end of its mould by the adjusting screw 13b retaining its supporting lever 13 until this latter reached the end 14a (see Fig. 3) of the plate 14. When in this position (on account of being liberated by the withdrawal of the bolt 19 at the point p^8 to open the moulds a, a^1) it is allowed to fall or descend by gravity thus permitting the moulded stopper to descend into a shoot which conducts it to the rotating cylindrical screen 40, and as the table 5 moves beyond said position, the lever 13 is carried forward so that its screw 13b, by encountering the inclined part 14b of the cam plate 14, is raised to again place the base 4a in position to cover the lower end of its mould 4.

The rotary screen 40 has a spiral or volute flange 40c fixed within it so that as it rotates, said flange carries forward any stoppers or articles received by it until on reaching its outer end these are deposited into any desired receptacle.

Rotary motion is transmitted from the shaft 9a by the pair of bevel wheels 40b to a shaft 41 upon which is fixed a chain wheel 42 which actuates a chain 43 in order to transmit motion to the wheel 44 that is fixed upon the screen 40.

Mounted upon the framework B of the machine and above the rotary table 5 is a pair of shears or scissors 21 and these shears or scissors 21 are actuated in one direction by a cam 22 and in the opposite direction by springs k, k^1 . The cam 22 is pivoted upon a vertical shaft 23 which reaches down so that a lateral extension or arm 23a from said shaft 23 may lie in the path of the series of vertical projections 24 carried by an annular member 24a

fixed on the mould bearings (Fig. 1), and these projections correspond in number with that of the moulds 4.

The rotating of the cam 22 as stated, causes said cam to move the pin 22a outwardly from it and this pin 22a is fixed to a sliding member 22b operating within guides 22c so that on oppositely extending arms 22d and 22e other pins 21f and 21g may be fixed and arranged to come into contact with the inclined ends 21h and 21k of the shears 21 by which means the blades of the shears 21 are made to approach each other to effect the cutting operations.

Fixed to the table 5 are five standards 27 and pivoted at s on the upper ends of these standards are levers 28 which are arranged to have their runners w actuated by the stationary cam surface 28a as they travel over same during the rotary motions of the table 5 with which they revolve.

Connected to, so as to be operated by, the levers 28 are pressing members 30, each of which is arranged to slide through its bearings 30a carried by the table 5 to act in connection with its respective compound mould 4. Each of the pressing members 30 is, in its respective order, caused to descend (into so as to press the glass in its mould 4) by the runner w on its lever 28 being brought under the actions of a cam lever 28b which is pivoted at p^1 (see Fig. 9) upon the fixed framework B. This cam lever 28b extends so that its outer end may be acted upon by a pressure spring 28c which is arranged to be adjusted by a screw 28d in order to withstand and overcome the ordinary pressure required for producing the moulded article, but which will yield, when, by any means, the said pressure is exceeded, and this yielding is to avoid breakages (should any irregularities occur) while still permitting the machine or apparatus to continue in motion.

The ascending of each of the pressing members 30 after completing its pressing actions, is effected by its runner w passing over the ascending cam-part 28a, shown by Fig. 4.

The pressing actions of the member 30 upon the molten glass within the mould causes said glass to flow to all parts of the said mould which therefore gives shape to same.

During the descent of each pressing member 30, it will bring down with it a spanning or gripping bracket 30b which will engage the upper members d, d^1 of the moulds in order to positively secure same against being forced open or apart during the pressing actions. When the said members d, d^1 are thus held in posi-

tion, so also are the members a , a^1 by reason of the extending ribs d^2 on the members d , d^1 entering notches formed in the members a , a^1 as shown by Fig. 7.

6 The shoot 15 is mounted upon an adjustable hand lever 15a (Figs. 1 and 3) which is pivoted at h upon a link 15b. This link 15b is pivoted at h^1 to the framework B in order to enable the attendant to
10 adjust the shoot 15 in the desired position for receiving the cut-off portions of glass and conducting same to the moulds 4 as these rotate in their paths beneath said shoot 15.

15 The blades of the shears 21 are hinged to each other by a hollow stud 21a (see Figs. 3 and 4) taking through them, while by the adjusting nuts 21b mounted on said stud, the said blades are forced
20 against each other. The hollow stud 21a is made to slide upon the upper end of another stud 21d which is fixed upon the framework B, while the bifurcated end 32a of the lever 32 spans the said stud
25 21a in order to support the shears in position upon the stud 21d. The lever 32 is pivoted at 32b upon a support 33 so that the other end of said lever 32 may be actuated by an adjusting nut 34a which
30 may be screwed over a bolt 34 in order to effect the adjusting of the shears 21 in a higher or lower position as may be required.

In order to permit the shears 21 to move
35 in a vertical direction, should anything carried by the table 5 come into contact with same and render such motion necessary to avoid breakages, I mount a spring 34b upon the bolt 34, to yield under the
40 actions stated.

After the molten glass has been pressed into the moulds a , a^1 and d , d^1 , the moulds d , d^1 are opened by the withdrawal of the bolt 19 and by the table 5 carrying
45 said opened moulds in its path they reach a fixed blade 35 (Fig. 1) which cuts-off the portion of superfluous glass left by the opened moulds d , d^1 extending above and beyond the closed moulds a , a^1 . This
50 superfluous glass falls or descends on to table 5 and from its position thereon it is removed by a blast of air so that it will descend into the shoot 36 from the base of which it is carried by another blast
55 of air along a tube 37 from which it is deposited where and as desired.

The actions of the apparatus are as follows:—

60 As the molten glass is descending from the furnace (somewhat as shown by broken lines Fig. 3) when each of the pairs of moulds is approaching a position beneath the shoot 15 and a little prior to reaching the position exactly beneath the shears
65 21, the projection 24 (acting in unison

with its respective mould) will commence to operate the arm 23a so that the cam 22 will cause the blades 21 to cut off the desired length of the depending plastic glass 3 on which this will fall into the
70 shoot 15 to be thereby guided immediately into the mould 4 which is in position to receive it, while the table 5 is at the same time moving beneath the shoot 15.

Prior to the mould having reached the position stated, the cams 20, 20a will have operated their respective bars 19, 19a to close the members of said mould.

After passing said shoot 15 the bowl w on the lever 28 is actuated by coming into
80 contact with the lever 28b so that the pressing member 30 will then press the molten glass within the mould. When this has been effected, the table 5 will have carried the mould forward so that
85 the bolt 19a will have moved beyond its cam 20a and will then come into contact with the cam 20c which will effect the opening of the moulds d , d^1 . The mould will then, by moving forward, be
90 approaching the blade 35 to cut-off the superfluous glass above the moulds a , a^1 . This cut-off part will then be removed through the discharge tube 37 as is hereinbefore explained, while the table will
95 continue in motion to carry the mould so that the bolt 19 will be withdrawn by the cam 20b thus opening the moulds a , a^1 so that the base part 13 may descend to deposit the moulded stopper into the
100 screen 40 as hereinbefore explained.

As is hereinbefore explained as the table 5 moves to carry the mould 4 beyond this position, its base part is replaced, both sets of moulds are closed and the
105 cycle of operations are repeated.

It may be observed that by having all the operating parts (which carry out the formation of the article to be produced)
110 mechanically driven so that each mould is entirely free from and independent of the other moulds, any one or more of said moulds may be put out of action without interfering with the effective actions of the other moulds. And further, by mak-
115 ing use of yielding members for carrying out the mould closing and pressing operations, provided one part or another of these devices becomes locked or rendered inoperative, said yielding members
120 permit the other parts of the machine to continue in motion without damaging or breaking any of the fittings or parts connected thereto.

To carry out the lubricating of the parts
125 I make use of a vessel 200 (Figs. 1 and 2) which is fixed in position so that the pipe 201 leading therefrom may have a rotary valve 202 mounted in it so that the lever 203 of said valve may be actuated
130

by one or other of several projections (not shown in the drawings) which are fixed upon and extend from the rotary mechanism carrying the moulds so that when
5 said projections actuate the lever arm 203 the valve is fed and immediately the projection has passed the lever 203 the valve is closed by the recoil of a spring 204.

Having now particularly described and
10 ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. In apparatus for moulding or producing articles of glass of the type or
15 class herein described, the employment of moulds formed of two pairs of hinged members with a hinged base piece, in combination with devices which by locking one pair of members in position also
20 secure the other members and base piece

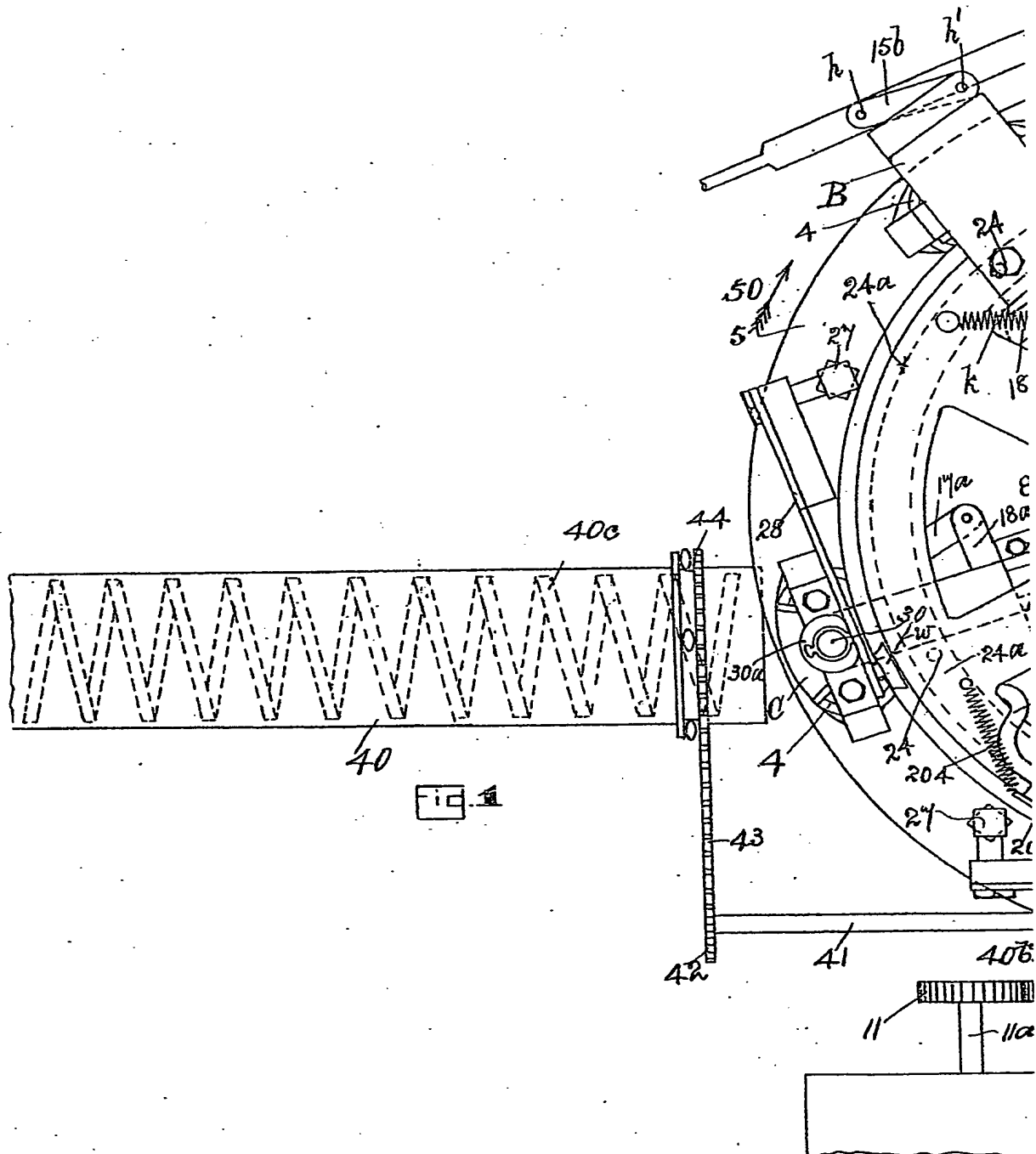
substantially as herein specified.

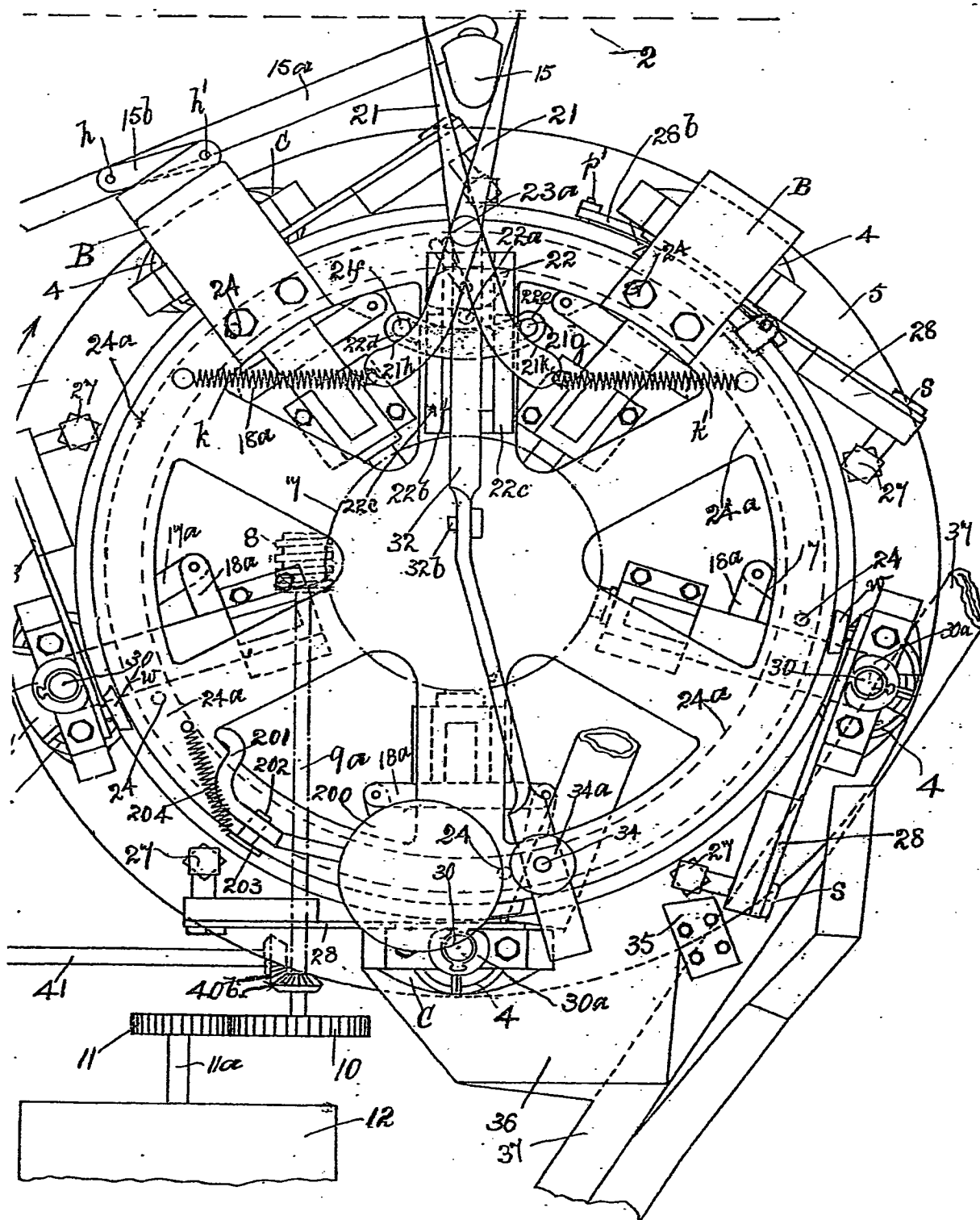
2. In apparatus having devices as claimed by Claim 1, the employment of a spring actuated cam lever for operating
25 the glass pressing members substantially as set forth.

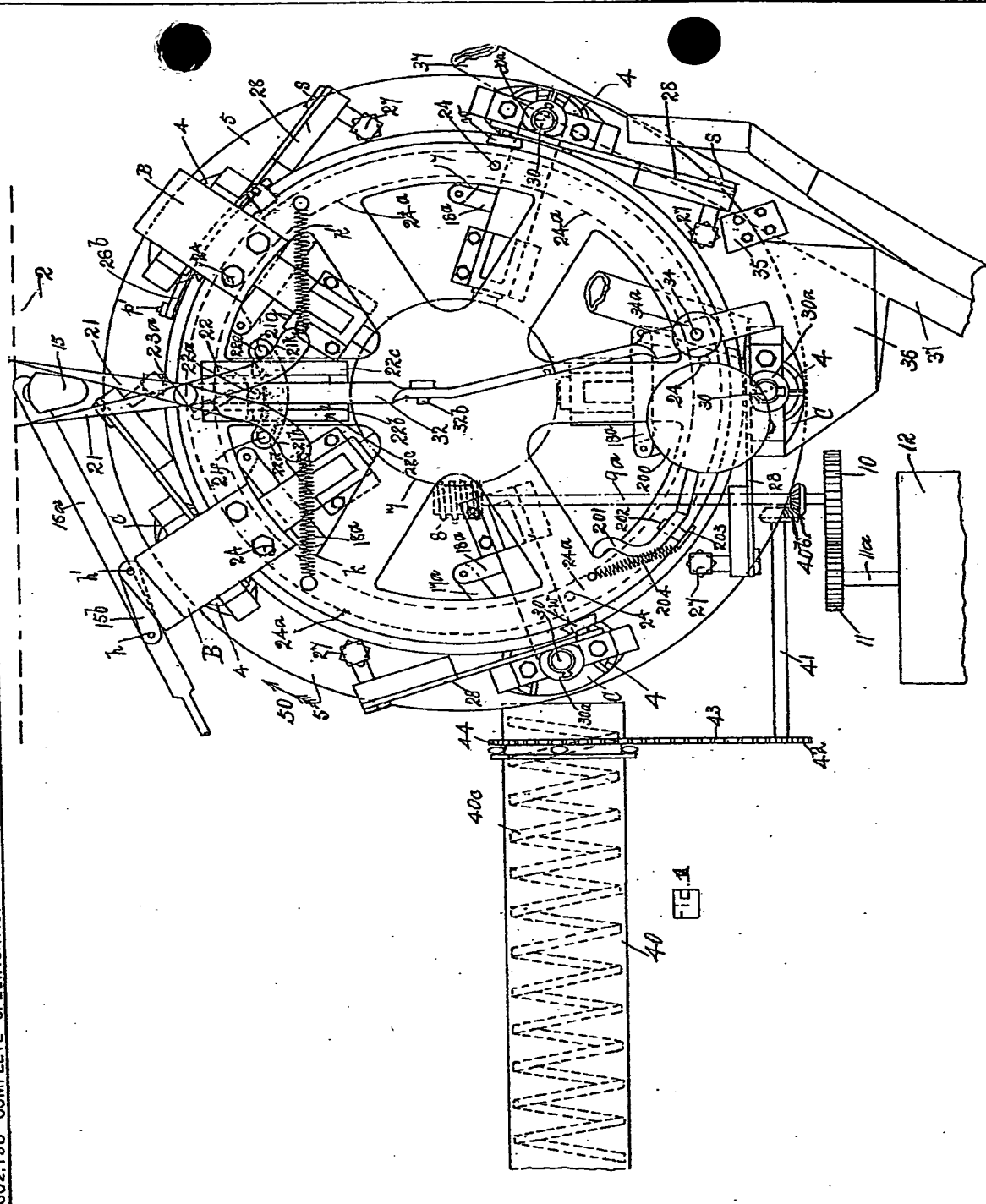
3. In devices as claimed by Claims 1 and 2 the employment of means whereby the superfluous glass is cut off and removed
30 from the machine substantially as herein described.

4. In apparatus having devices as claimed by Claims 1 and 2 the employment of a rotary member for receiving
35 the moulded articles of glass and conveying same to the position desired substantially as set forth.

Dated the 8th day of June, 1928.
SAMUEL HEY,
Agent.







[This Drawing is a reproduction of the Original on a reduced scale]

302,193 COMPLETE SPECIFICATION.

[This Drawing is a reproduction of the Original on a reduced scale.]

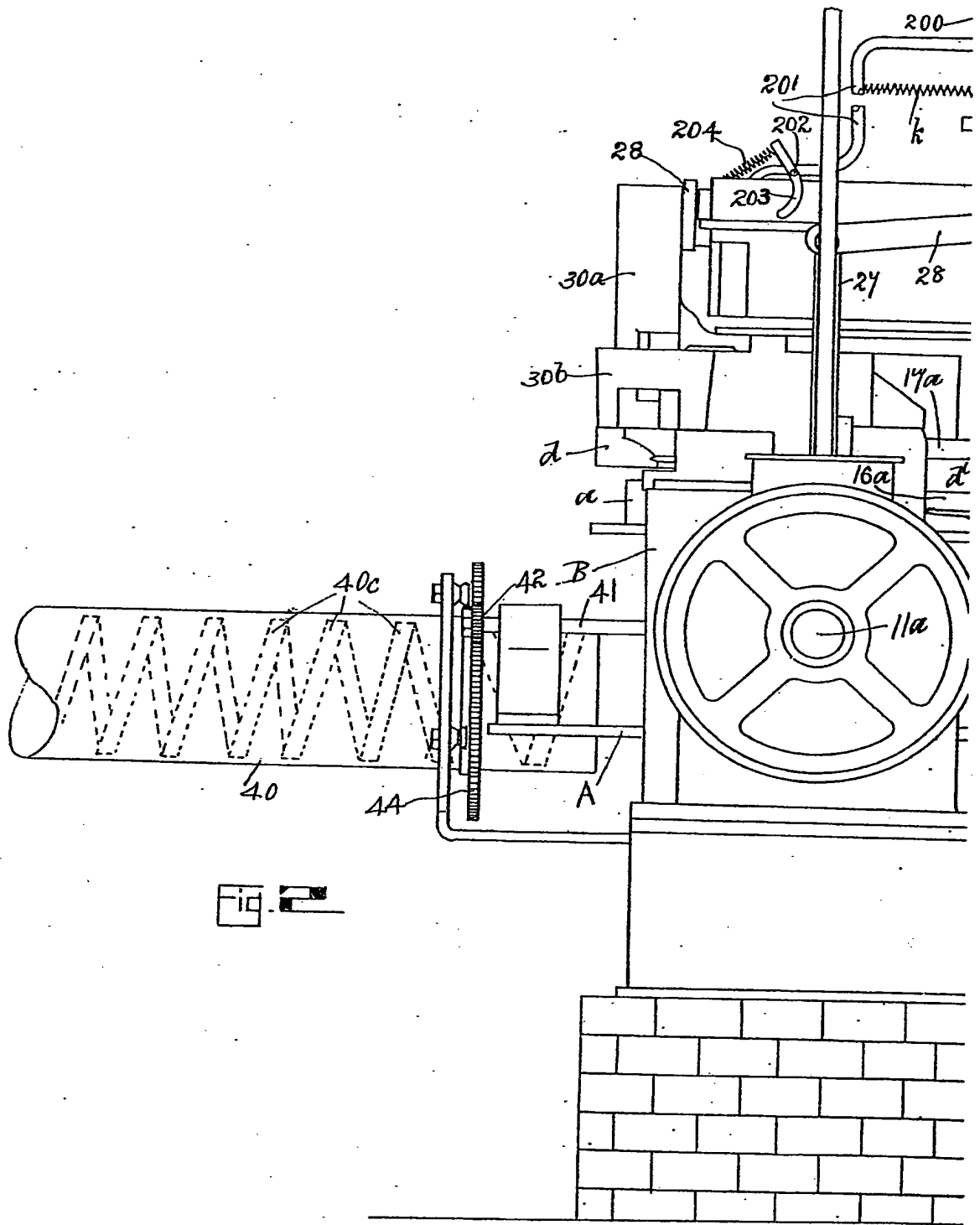
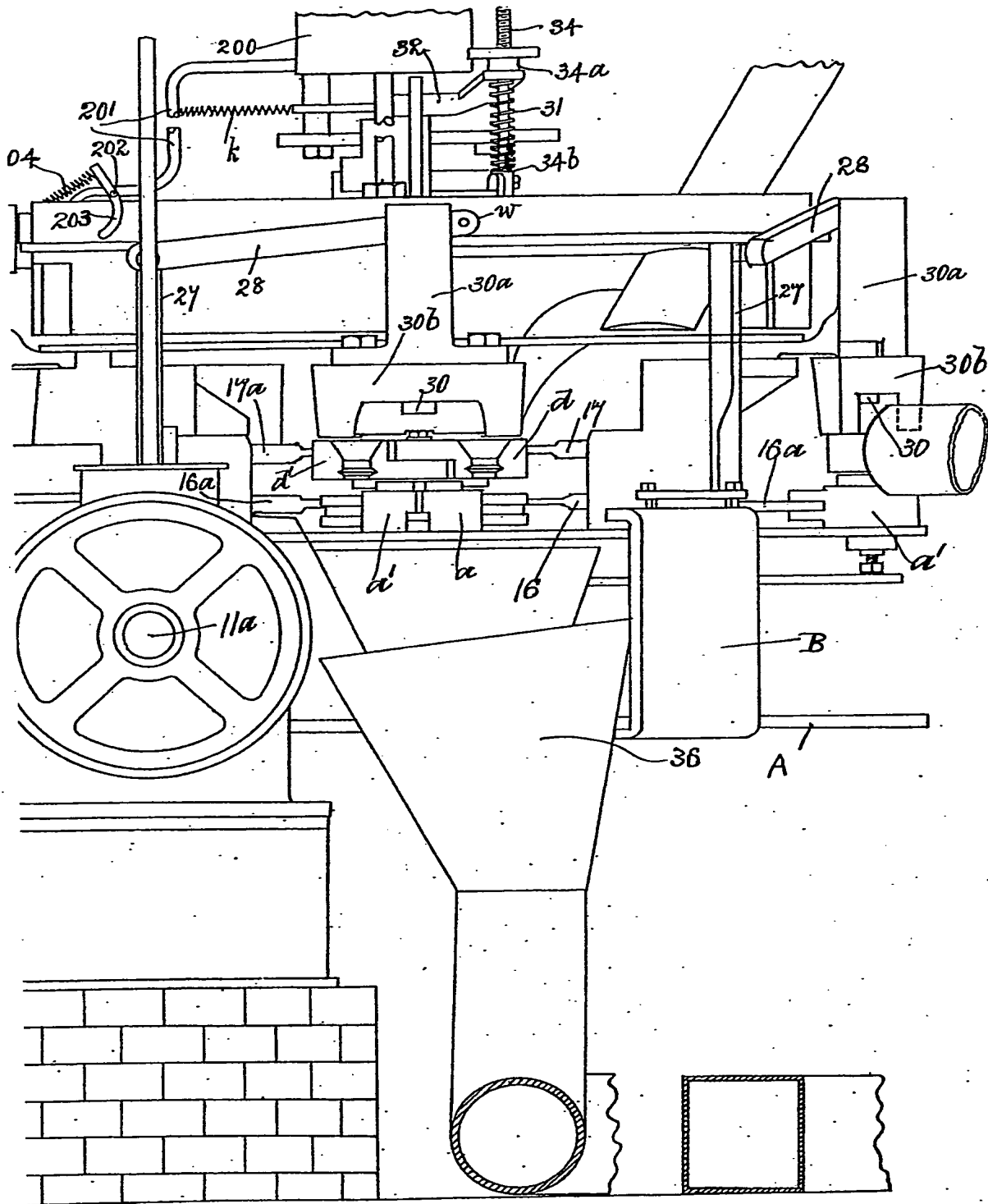
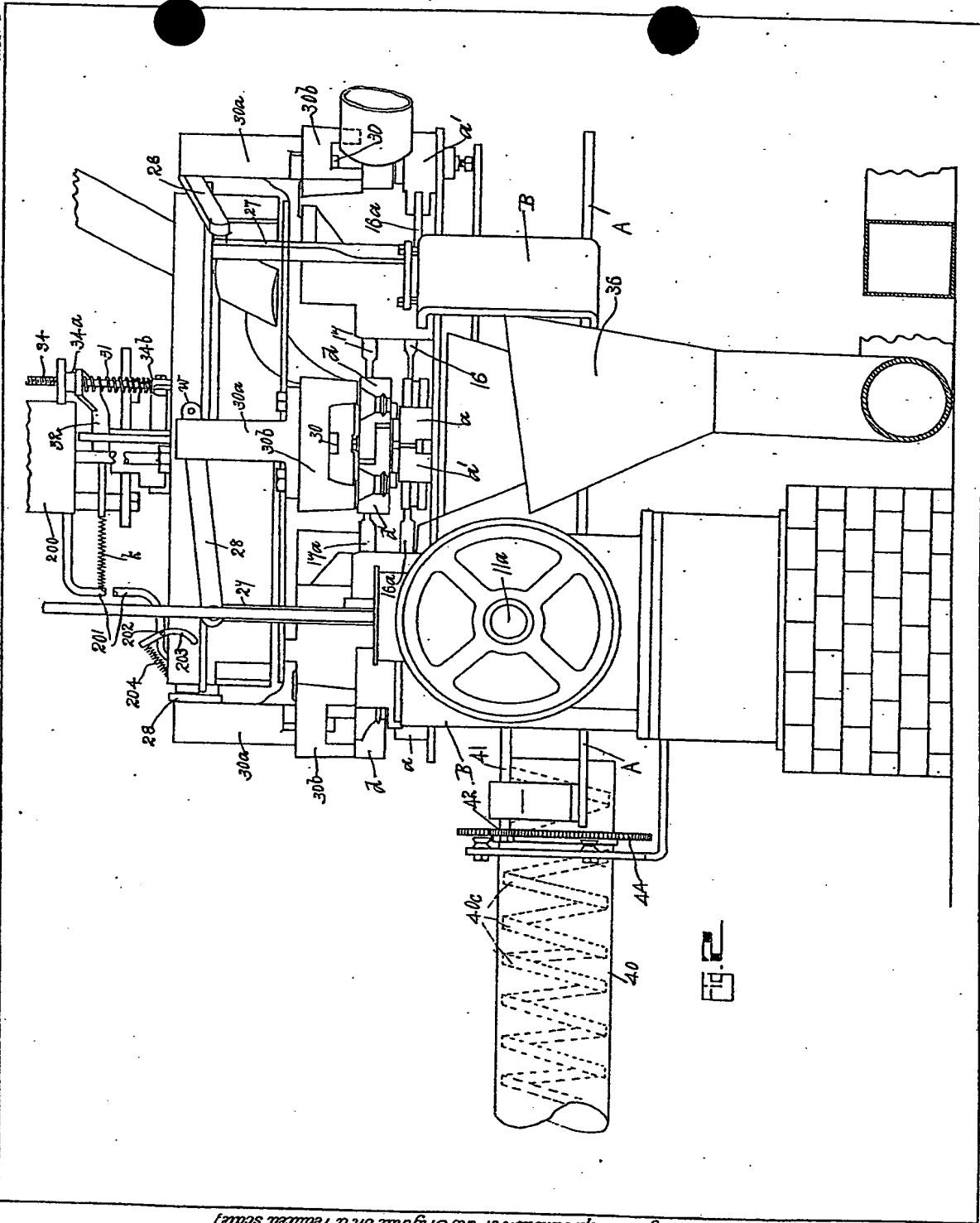


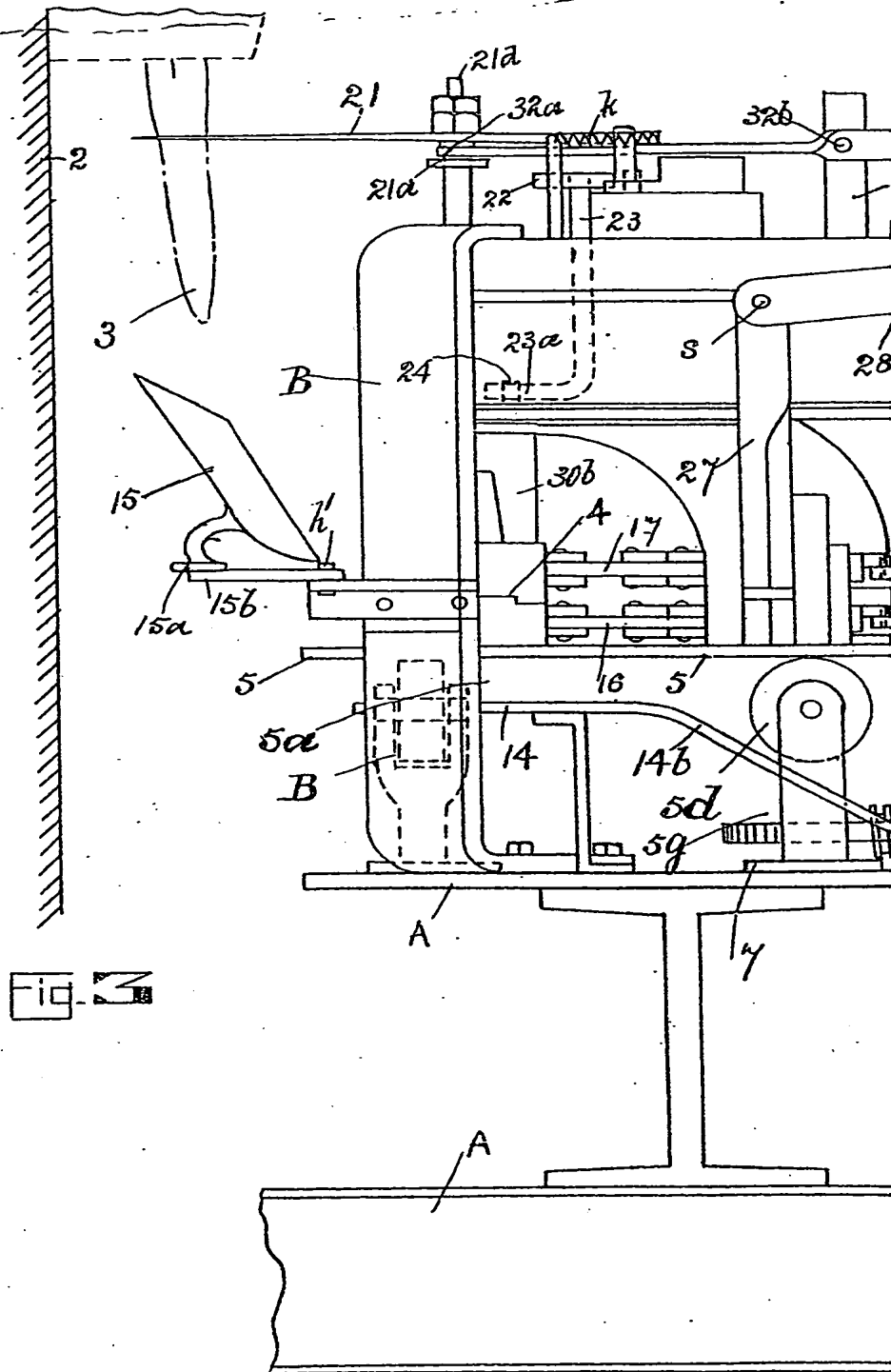
Fig. 2

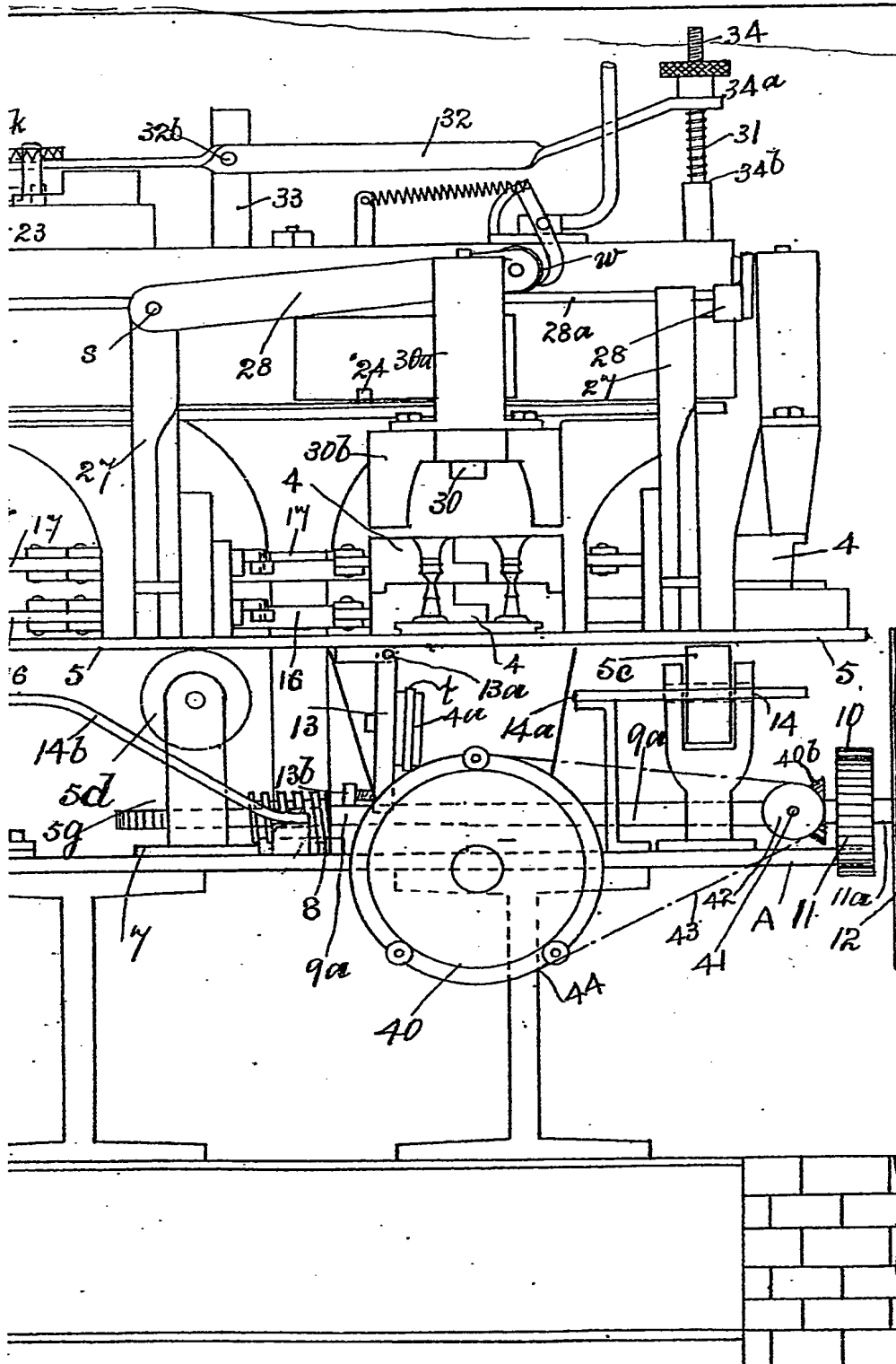




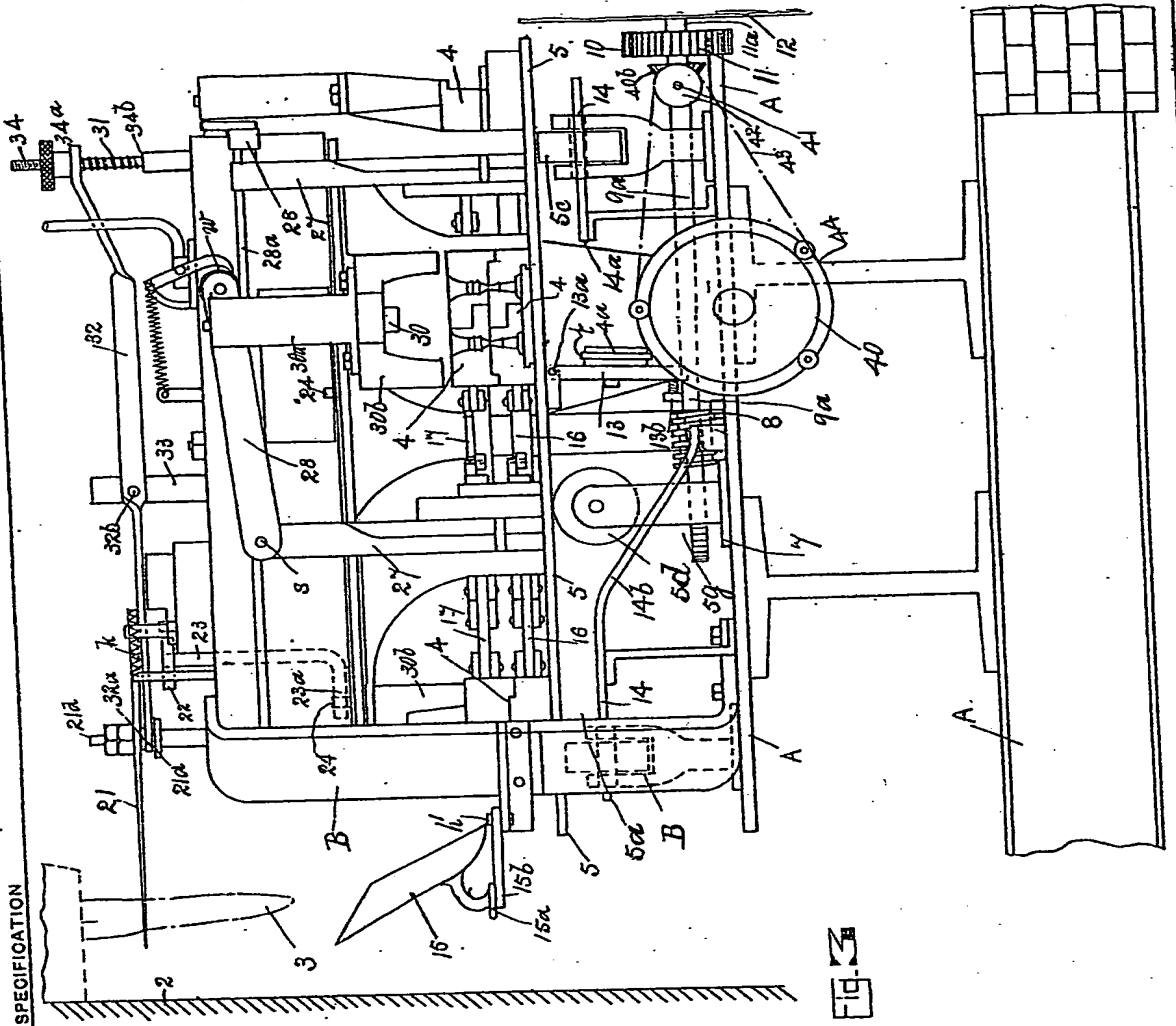
[This Drawing is a reproduction of the Original on a reduced scale]

[This Drawing is a reproduction of the Original on a reduced scale]





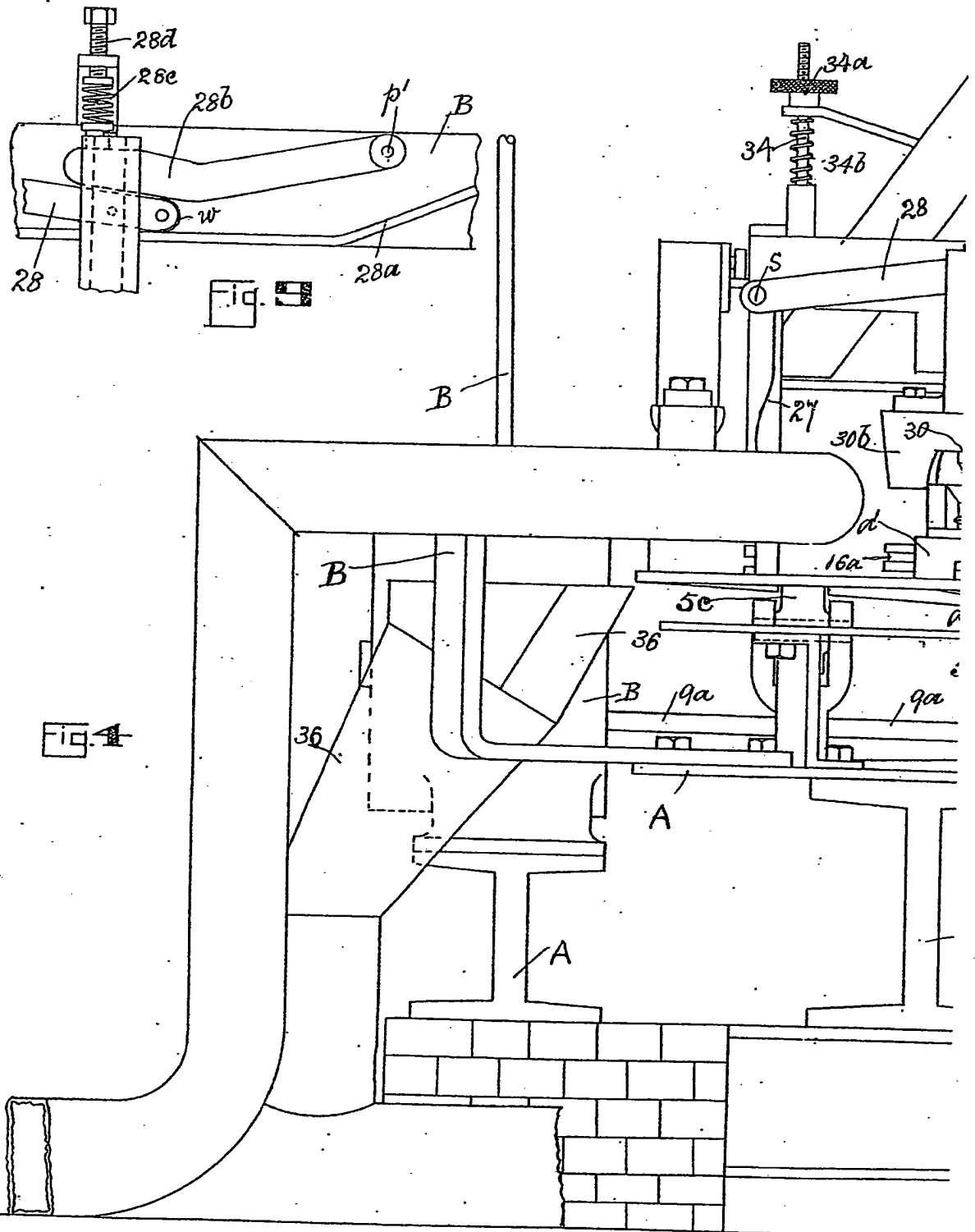
302,193 COMPLETE SPECIFICATION

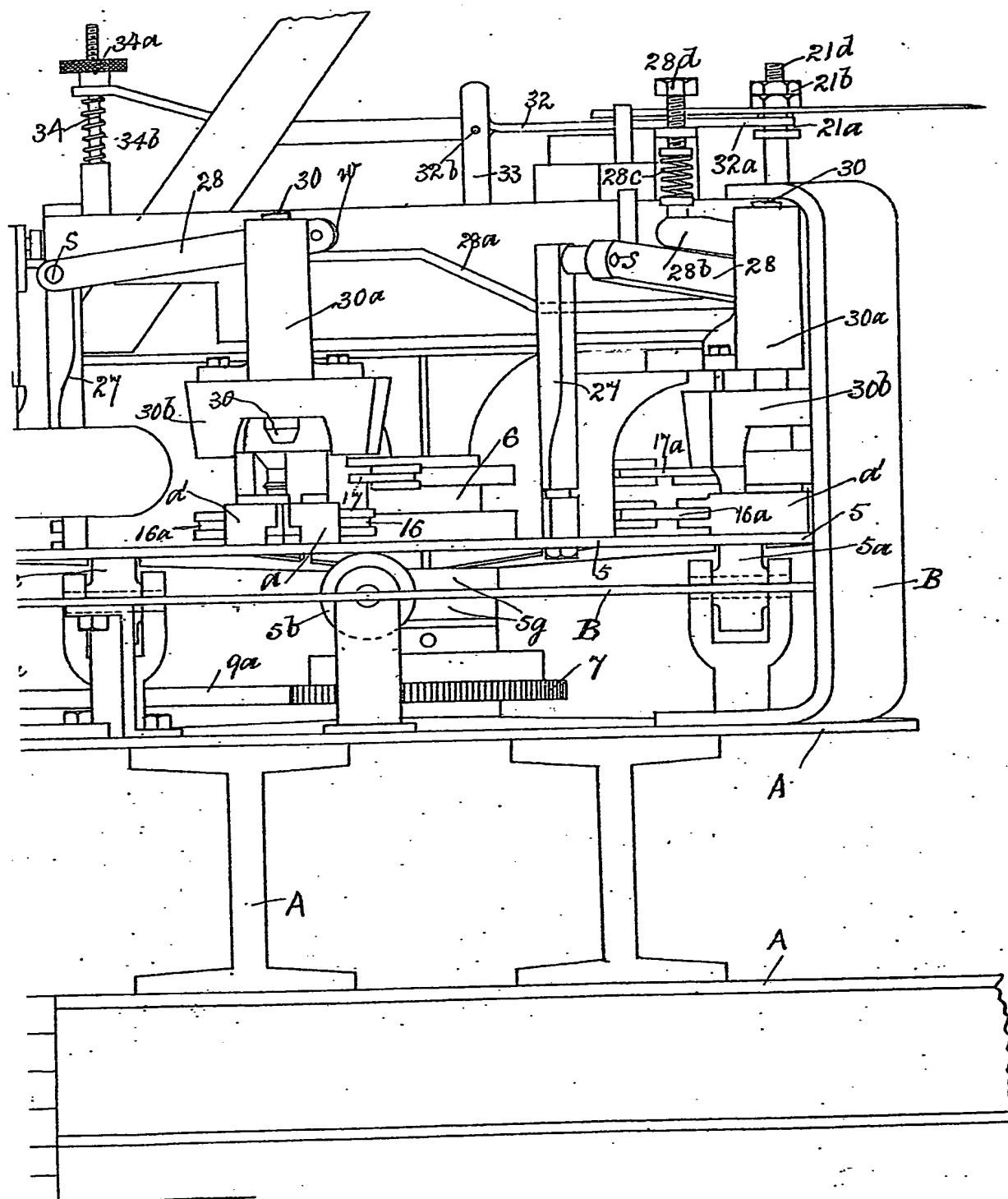


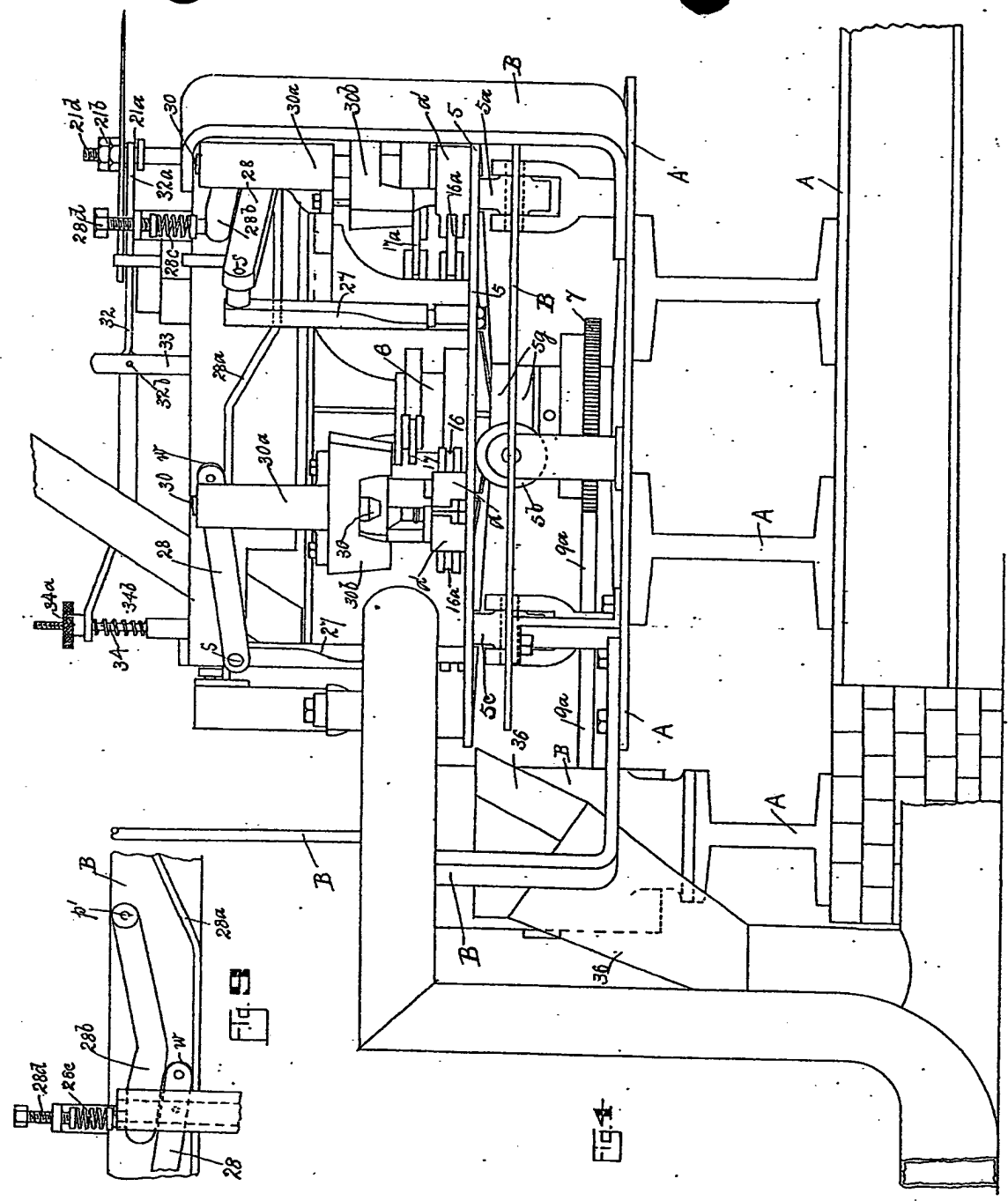
[This Drawing is a reproduction of the Original on a reduced scale]

302,193 COMPLETE SPECIFICATION

[This Drawing is a reproduction of the Original on a reduced scale.]

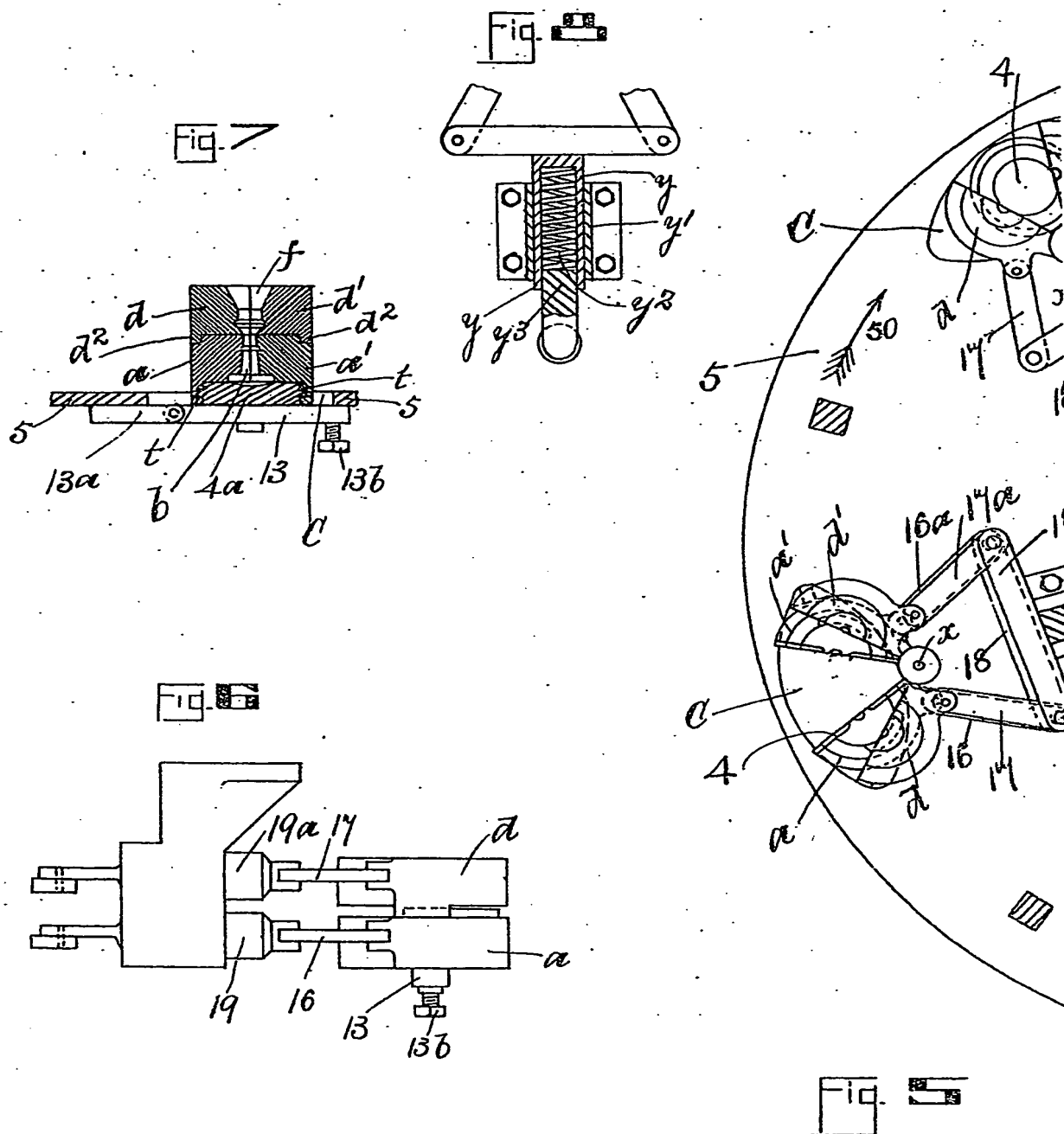


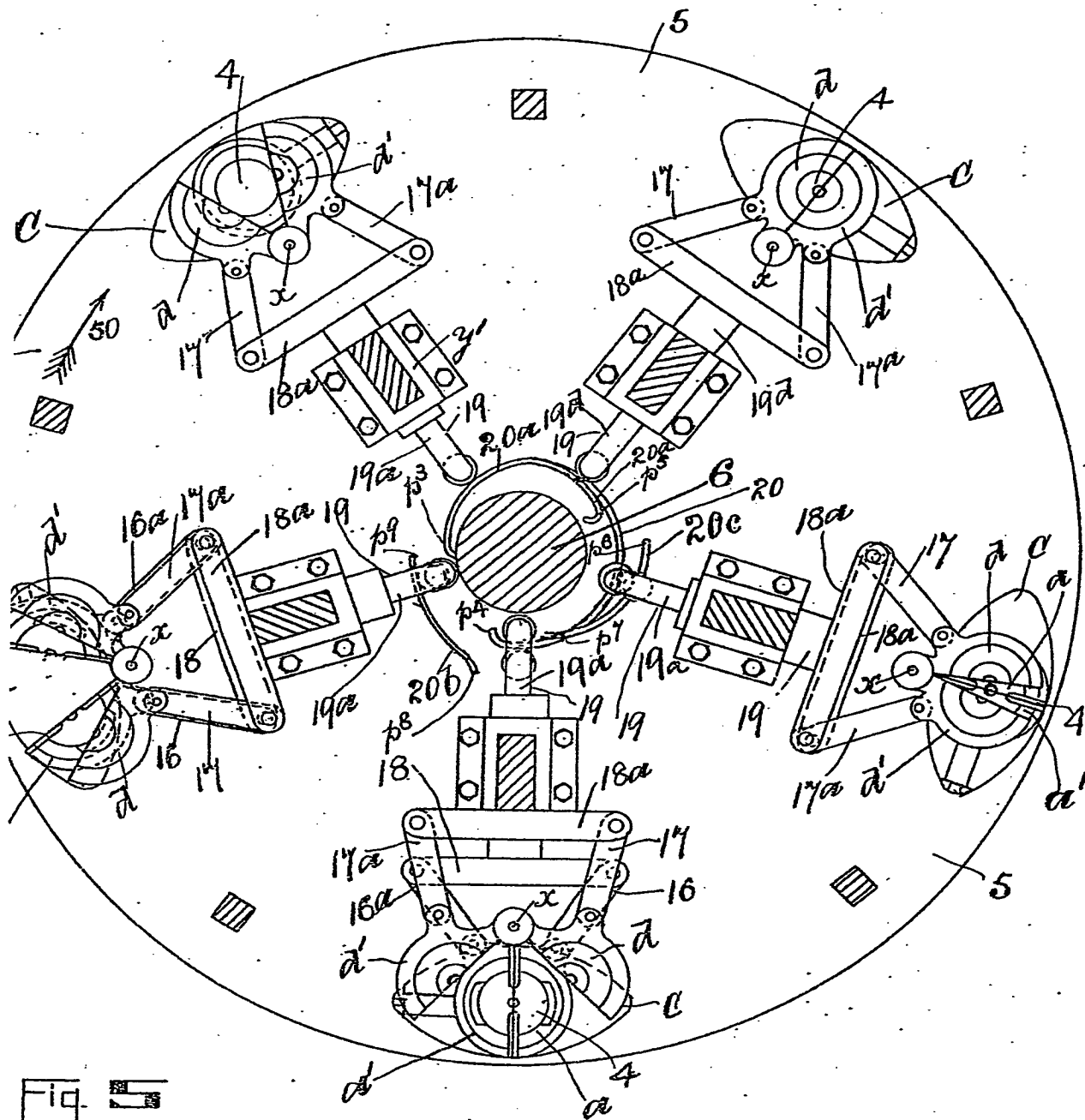




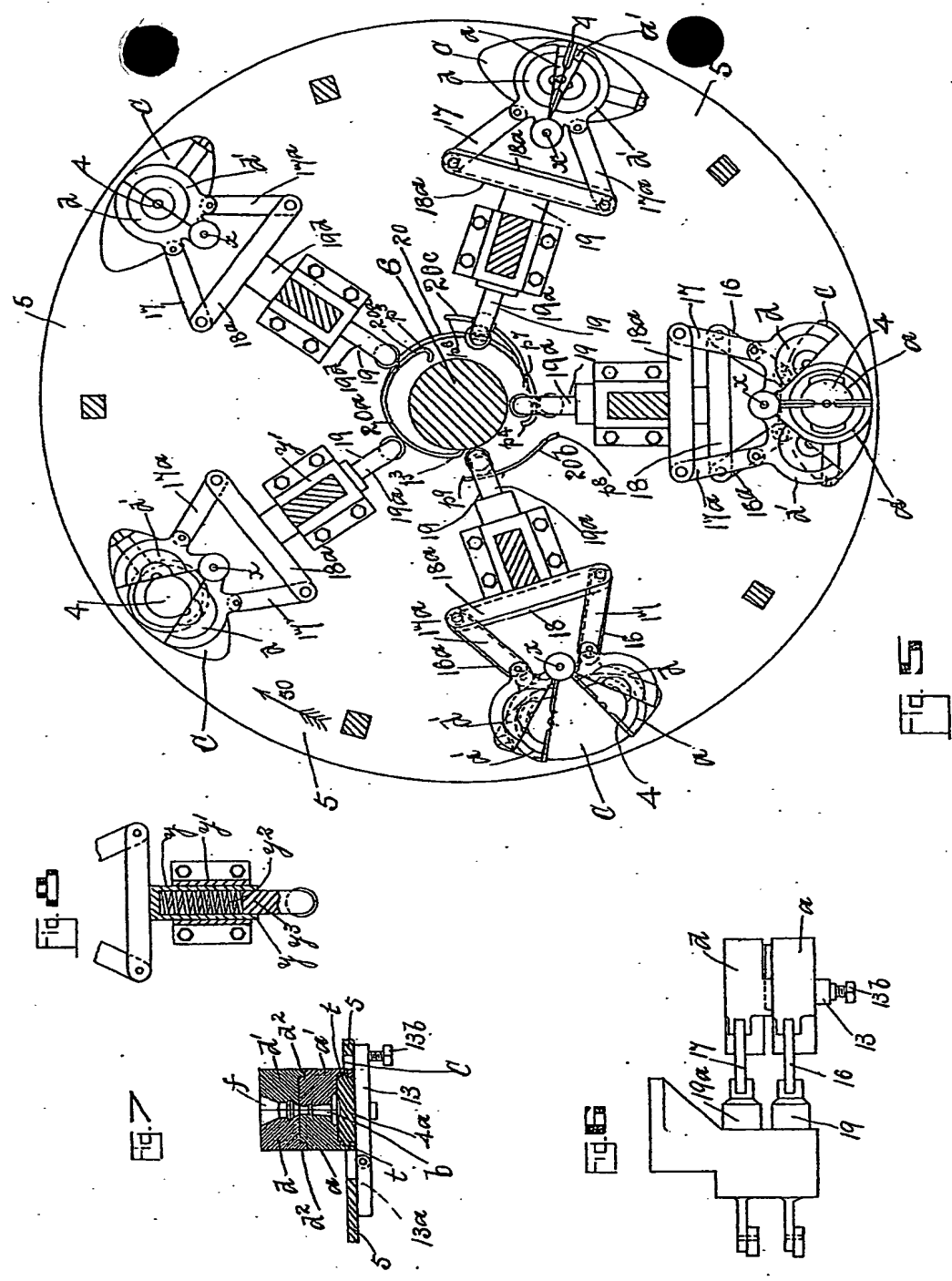
[This Drawing is a reproduction of the Original on a reduced scale]

[This Drawing is a reproduction of the Original on a reduced scale]





[This Drawing is a reproduction of the Original on a reduced scale]



THIS PAGE BLANK (USPTO)

**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☐ BLACK BORDERS
- ☐ IMAGE CUT OFF AT TOP, BOTTOM OR SIDES
- ☒ FADED TEXT OR DRAWING
- ☐ BLURRED OR ILLEGIBLE TEXT OR DRAWING
- ☐ SKEWED/SLANTED IMAGES
- ☐ COLOR OR BLACK AND WHITE PHOTOGRAPHS
- ☐ GRAY SCALE DOCUMENTS
- ☒ LINES OR MARKS ON ORIGINAL DOCUMENT
- ☐ REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY
- ☐ OTHER: _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.

THIS PAGE BLANK (USPTO)